PROBLEMS FOR SOLUTION.

ARITHMETIC.

90. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Find the greatest number of inch balls that can be placed in a box 10 inches square and 5 inches deep.

91. Proposed by RAYMOND D. SMITH, Tiffin, Ohio.

A barn 20 feet square is standing in a pasture, and a horse is tied to one corner of it with a rope 50 feet long. Over how much land can he graze ?

92. Proposed by J. A. CALDERHEAD, M. Sc., Professor of Mathematics in Curry University, Pittsburg, Pa.

What rate of income do I realize by purchasing United States 4% bonds at 105 if I sell them in six years at 104 ?

*** Solutions of these problems should be sent to B. F. Finkel, not later than April 10.

GEOMETRY.

88. Proposed by FREDERICK R. HONEY, Ph. B., Instructor in Mathematics in Trinity College, New Haven, Conn.

Prove that the volume of the frustum of a cone is equal to one-sixth of the altitude multiplied by the sum of the areas of the upper base, the lower base, and four times the area of the section midway between the upper and lower bases.

89. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Describe a circle tangent to three given circles. [From *Chauvenett's Geometry*, page 318, ex. 213.]

90. Proposed by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics in Russell College, Lebanon, Va.

The bisectors of the angles of the opposite sides (produced) of an inscribed quadrilateral cut the sides at the angular points of a rhombus.

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CALCULUS.

70. Proposed by J. OWEN MAHONEY, B. E., M. Sc., Graduate Fellow in Mathematics in Vanderbilt University, P. O., Lynnville, Tenn.

Prove $\int_0^\infty \frac{\cos ax}{1+x^{2n}}dx = -i\frac{\pi}{n}\sum_{r=1}^{n}\omega^{2r-1}e^{ai\omega^{2r-1}}$

where n is an integer, a is positive, and ω is $e^{i\pi/2n}$.

Is this correct ? Forsyth gives, on page 41, of his *Theory of Functions*, the integral

$$\int_{-\infty}^{\infty} \frac{\cos ax dx}{1+x^{2n}} = -i\frac{\pi}{2l}\sum_{r=1}^{n}\omega^{2r-1}e^{ai\omega^{2r-1}}.$$

71. **Proposed by J. C. CORBIN, Pine Bluff, Ark.**

Form the differential equation of the third order, of which $y=c_1e^{2x}+c_2e^{-3x}+c_3e^x$ is the complete primitive.

72. **Proposed by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics, The Russell College, Lebanon, Va.**

A man has a park in the form of a parabolic segment cut off by a chord making an angle $\pi/4$ with the axis. Within the park is a right angled triangular flower plat with one vertex at the center of gravity of the segment, the other vertex at the lower extremity of the chord, and the right angle on the diameter bisecting the chord. The park contains 30 acres, and the perimeter of triangle in linear measure equals the area in square measure. Find the length of the chord, the latus-rectum of the parabola, and the dimensions of the triangle.

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MECHANICS.

64. **Proposed by B. F. FINKLE, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.**

A cylindrical vessel, radius of vessel r and altitude h, is filled with water and rests on a horizontal plane. It is required to ascertain the maximum angle of elevation to which the plane may be raised without the vessel falling, allowing the coefficient of friction to be such as to prevent sliding, and the water to overflow as the plane is raised.

65. **Proposed by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics, The Russell College, Lebanon, Va.**

The distance, parallel to the axis, from the mid-point of a chord to the arc of a parabola is constant. Show that the center of gravity of all segments formed by the chord is an equal parabola.

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DIOPHANTINE ANALYSIS.

62. **Proposed by JOHN M. ARNOLD, Crompton, R. I.**

Find, if possible, four square numbers in arithmetical progression.

63. **Proposed by A. H. HOLMES, Brunswick, Me.**

Given $x^2+y^3=20^3\times105498$, to find four positive *integral* values each for x and y.

64. **Proposed by SYLVESTER ROBINS, North Branch Depot, N. J.**

It is required to take from the proper *key* suitable material and hastily construct a "nest" of 10 or 15 prime, integral, rational trapeziums, each containing an area equal to the square root of the product of its four sides.

65. **Proposed by MANSFIELD MERRIMAN, Professor of Civil Engineering, Lehigh University, South Bethlehem, Pa.**

Show that the number 1521 can be expressed in seven different ways as the sum of three perfect squares ? Can more than seven different ways be found ?

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